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Invistigation of Surface Properties of Nanostructured Carbon Films

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Abstract : Due to their unique properties, carbon nanofilms have become the object of general attention and intensive research. In this case it plays a very important role to study surface properties of these films. It is also important to study processes of forming of this films, which is accompanied by a process of self-organization at the nano and micro levels. For more detailed investigation, we examined diamond-like carbon (DLC) layers deposited by chemical vapor deposition (CVD) method on Ge substrate and hydro-generated grapheme layers obtained on surface of colloidal solution using grouping method. In this report surface transformation of these CVD nanolayers is studied by atomic force microscopy (AFM) upon deposition time. Also, it can be successfully used to study surface properties of self-assembled grapheme layers. In turn, it is possible to sketch out their boundary line, which enables one to draw an idea of peculiarities of formation of these layers. Images obtained by AFM are investigated as a mathematical set of numbers and fractal and roughness analysis were done. Fractal dimension, Regne's fractal coefficient, histogram, Fast Fourier transformation, etc. were obtained. The dependence of fractal parameters on the deposition duration for CVD films and on temperature of solution tribolayers was revealed. As an important surface parameter for our carbon films, surface energy was calculated as function of Regne's fractal coefficient. Surface potential was also measured with Kelvin probe method using semi-contacting AFM. The dependence of surface potential on the deposition duration for CVD films and on temperature of solution for hydro-generated graphene was found as well. Results obtained by fractal analysis method was related with purly esperimental results for number of samples.

Keywords : nanostructured films, self-assembled grapheme, diamond-like carbon, surface potential, Kelvin probe method, fractal analysis
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